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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the solid polyelectrolyte type fuel cell which used solid polymer membrane as an electrolyte, and relates to what added improvement to gas sealing structure especially.

[0002]

[Description of the Prior Art]In recent years, the fuel cell which used the electrochemical reaction by fuel, such as hydrogen, and oxidizers, such as oxygen, as a device which transforms into electrical energy directly the chemical energy which fuel has attracts attention. Although various types are proposed by this fuel cell, the solid polyelectrolyte type fuel cell which used solid polymer membrane for the electrolyte is known as one of them. Drawing 18 and drawing 19 are what showed the composition of the solid polyelectrolyte type fuel cell, and explain this composition below.

[0003]As shown in a figure, the gas diffusion electrode (product made from porous carbon) of the couple which consists of the anode electrode 1a and the cathode terminal 1b is provided in the solid polyelectrolyte type fuel cell, and the catalyst bed 2a with a thickness of 30 micrometers which consists of Pt(s) etc., respectively, and 2b are formed in each electrodes 1a and 1b. The solid polymer membrane 3 is formed as an electrolyte layer, and this film 3 is pinched by the electrodes 1a and 1b via the catalyst bed 2a and 2b, and is made and arranged. The cell 4 comprises these electrodes 1a and 1b and the solid polymer membrane 3.

[0004]As the cell 4 is inserted, the gas impermeability separator 5 is installed. The gas distribution groove for supplying fuel gas, such as hydrogen, to the anode electrode 1a, and supplying oxidant gas, such as oxygen, to the cathode terminal 1b, respectively is formed in the separator 5. Between the solid polymer membrane 3 and the separator 5, the sealant 8

made of Viton rubber which touches the peripheral part of the electrodes 1a and 1b is installed. The sealant 8 prevented the gas leak to the outside of a system, and has achieved the work which avoids the danger of explosion by combustible gas, such as decline in the rate of gas utilization, and hydrogen.

[0005] There are a perfluoro sulfonic acid film etc. which are for example, fluorine system ion-exchange membranes as the above-mentioned solid polymer membrane 3. The solid polymer membrane 3 has an exchange group of a hydrogen ion in a molecule, and functions as an ion-conductive substance by carrying out saturation water. The solid polymer membrane 3 also has the gas separating function to separate the electrodes 1a and 1b, the fuel gas supplied, and oxidant gas, prevents the electrode 1a and the sag by the cross leakage (mixing of fuel gas and oxidant gas) between 1b, and makes a cell operate in the long run.

[0006] In the solid polyelectrolyte type fuel cell which has the above composition, by supplying fuel gas, such as hydrogen, to the anode electrode 1a, and supplying oxidant gas, such as oxygen, to the cathode terminal 1b, electrochemical reaction occurs and electromotive force arises in the cell 4. The gas supplied to the electrodes 1a and 1b is humidified so that the relative humidity in the cell 4 may be 100%. This is for preventing the desiccation of the solid polymer membrane 3 which causes aggravation of ion conductivity.

[0007] By the way, after making the cell 4 into the cell layered product 6 (it illustrates to drawing 18) by which plural laminates were carried out via the separator 5 since the electromotive force of the cell 4 was usually as low as less than 1V when a solid polyelectrolyte type fuel cell is actually used, it is used as a cell stack. At this time, the cold plate 7 which circulates a refrigerant is inserted every cell layered product 6, and the surplus heat generated in connection with electrochemical reaction by work of the cold plate 7 is removed.

[0008]

[Problem(s) to be Solved by the Invention] There was a problem which is raised to the next in the above-mentioned solid polyelectrolyte type fuel cell. Although the temperature and water content of the solid polymer membrane 3 change at the time of a load change at the time of the deactivation of a fuel cell, and storage, it may follow on this change, the solid polymer membrane 3 may expand or contract, and shearing stress may arise in the solid polymer membrane 3. In addition, since the solid polyelectrolyte type fuel cell was used as a cell stack as the preceding paragraph described, shearing stress occurred into the portion to which the seal of the solid polymer membrane 3 is carried out by the sealant 8 at the time of stack bolting.

[0009] When shearing stress arose in the solid polymer membrane 3 and still more nearly temporal degradation followed, there was a possibility that the solid polymer membrane 3 might fracture. If the solid polymer membrane 3 fractured, the cross leakage of fuel gas and oxidant gas occurred, voltage fell remarkably, and the fault that the driving continuation of a

cell became impossible arose.

[0010]This invention is proposed in order to cancel such a problem, and it is a thing. the purpose is to provide a solid polyelectrolyte type fuel cell with high reliability in which long-term operation is possible by reducing the shearing stress boiled and produced, preventing the cross leakage by membranous fracture, and raising gas-seal performance.

[0011]

[Means for Solving the Problem]In order to attain the above-mentioned purpose, a solid polyelectrolyte type fuel cell corresponding to claim 1, A gas diffusion electrode of a couple which consists of a cathode terminal and an anode electrode as solid polymer membrane is provided as an electrolyte layer and sandwiches said solid polymer membrane is arranged, As said gas diffusion electrode is inserted, a separator of a gas impermeability couple is installed, In a solid polyelectrolyte type fuel cell with which a sealant of a couple has been arranged as it was furthermore inserted into said solid polymer membrane and said separator and a peripheral part of said gas diffusion electrode was touched, It is characterized [constitutional] by having been inserted into said solid polymer membrane, said sealant, and said solid polymer membrane and said gas diffusion electrode, and having arranged a sheet.

[0012]In an invention of claim 1 which has the above-mentioned composition, a sheet is that of a wrap about a solid polymer membrane, shearing stress to solid polymer membrane by a sealant can be reduced, and a membranous fracture can be prevented. And a sheet can assist gas separating performance of solid polymer membrane. Therefore, the reliability of a gas-seal function improves.

[0013]A solid polyelectrolyte type fuel cell corresponding to claim 2, A gas diffusion electrode of a couple which consists of a cathode terminal and an anode electrode as solid polymer membrane is provided as an electrolyte layer and sandwiches said solid polymer membrane is arranged, As said gas diffusion electrode is inserted, a separator of a gas impermeability couple is installed, In a solid polyelectrolyte type fuel cell with which the upper surface or the undersurface of said separator was furthermore touched, and a sealant of a couple has been arranged as a peripheral part of said solid polymer membrane and said gas diffusion electrode was touched, It was inserted into sealants, and said solid polymer membrane and said gas diffusion electrode of said couple, and a sheet has been arranged.

[0014]Since a sealant is arranged in an invention of claim 2 which has the above-mentioned composition so that a peripheral part of solid polymer membrane may be touched, Cost reduction by reduction of area of solid polymer membrane is possible, and the same operation effect as an invention of claim 1 can be demonstrated in such a solid polyelectrolyte type fuel cell.

[0015]A solid polyelectrolyte type fuel cell corresponding to claim 3 was set up in the solid

polyelectrolyte type fuel cell according to claim 1 or 2 for a long time than a width dimension of said sheet in which a direction of a width dimension of said sheet arranged at said cathode terminal side has been arranged at said anode electrode side.

[0016]In an invention of claim 3 which has the above-mentioned composition, since a width dimension of a sheet arranged at the cathode terminal side is made longer than a width dimension of a sheet arranged at the anode electrode side, supply by the side of a cathode terminal of a proton generated by the anode electrode side is not checked. Therefore, $C+2H_2O \rightarrow CO_2+4H^+$ Corrosion of an electrode by the reaction $+4e^-$ can be prevented. That is, when width of a sheet arranged at a gas diffusion electrode is made to increase, the gas-seal performance can be improved and the time of application-of-pressure operation and electrode differential pressure increase, preventing corrosion of an electrode, it can respond.

[0017]A solid polyelectrolyte type fuel cell corresponding to claim 4, A gas diffusion electrode of a couple which consists of a cathode terminal and an anode electrode as solid polymer membrane is provided as an electrolyte layer and sandwiches said solid polymer membrane is arranged, In a solid polyelectrolyte type fuel cell with which a separator of a gas impermeability couple was installed as sandwiched said gas diffusion electrode, as it was inserted into said solid polymer membrane and said separator and an end of said gas diffusion electrode was covered, a sheet of KO type has been arranged for a section.

[0018]In an invention of claim 4 carried out to the above-mentioned composition, some sheets of KO type can realize improvement in membranous prevention from a fracture, and gas separating performance for solid polymer membrane by that of a wrap. And it is not necessary to provide separately a sealant [bolting / a sealant], and since load is also equivalent, it is possible to reduce local shearing stress of solid polymer membrane substantially.

[0019]A solid polyelectrolyte type fuel cell corresponding to claim 5, In a portion which touches said solid polymer membrane of a sheet of said KO type, a direction of a width dimension of a portion arranged at said cathode terminal side is the solid polyelectrolyte type fuel cell according to claim 4 setting up for a long time than a width dimension of a portion arranged at said anode electrode side.

[0020]In an invention of claim 5 which has such composition, preventing corrosion generating of an electrode by supply inhibition by the side of a cathode of a proton generated by the anode side like an invention of above-mentioned claim 3, width of a sheet arranged at a gas diffusion electrode is made to increase, and gas-seal performance can be improved.

[0021]A solid polyelectrolyte type fuel cell corresponding to claim 6, In the solid polyelectrolyte type fuel cell according to claim 1, 2, 3, 4, or 5, a catalyst bed which touches said solid polymer membrane is provided in said gas diffusion electrode, and it was constituted so that said sheet might touch a peripheral part of said catalyst bed.

[0022]Since a sheet is constituted so that a peripheral part of a catalyst bed may be touched,

thickness of a sheet can be made to increase even to the same grade as thickness of a catalyst bed in an invention of claim 6 which has such composition. Therefore, the tolerance of intensity in a sheet or electrode differential pressure can be improved, and the reliability of a gas-seal function improves.

[0023]In a solid polyelectrolyte type fuel cell given in claims 1, 2, 3, 4, 5, and 6, as for a solid polyelectrolyte type fuel cell corresponding to claim 7, said sheet comprised a fluoro-resin. Since a fluoro-resin is excellent in heat resistance, acid resistance, and a water resisting property, it can aim at improvement in the endurance of a sheet by having the above-mentioned composition.

[0024]A solid polyelectrolyte type fuel cell corresponding to claim 8, A gas diffusion electrode of a couple which consists of a cathode terminal and an anode electrode as solid polymer membrane is provided as an electrolyte layer and sandwiches said solid polymer membrane is arranged, An end of said gas diffusion electrode was coated with coat material in a solid polyelectrolyte type fuel cell with which a separator of a gas impermeability couple was installed as sandwiched said gas diffusion electrode.

[0025]Since coat material can cover an end of solid polymer membrane according to the invention of claim 8 of the above-mentioned composition, improvement in gas separating performance can be aimed at. Since it becomes do not need to provide separately a sealant [bolting / a sealant] and equivalent [load], generating of local shearing stress of solid polymer membrane is prevented, and a fracture of solid polymer membrane can be prevented.

[0026]A solid polyelectrolyte type fuel cell corresponding to claim 9, A direction of a width dimension of said coat material with which said cathode terminal side was coated is the solid polyelectrolyte type fuel cell according to claim 8 setting up for a long time than a width dimension of said coat material with which said anode electrode side was coated.

[0027]In an invention of claim 9 which it has, the above-mentioned composition as well as an invention of above-mentioned claims 3 and 5, Since supply by the side of a cathode of a proton generated by the anode side is performed smoothly, an electrode does not corrode, width of coat material arranged at a gas diffusion electrode is made to fully increase, and gas-seal performance can be improved.

[0028]A solid polyelectrolyte type fuel cell corresponding to claim 10 is characterized by said coat material comprising a fluoro-resin or a charge of a glass seal material in the solid polyelectrolyte type fuel cell according to claim 8 or 9. In an invention which has such composition, acid resistance and heat resistance of a coating part improve, and there is a operation effect that gas-seal performance increases.

[0029]A solid polyelectrolyte type fuel cell corresponding to claim 11, A gas diffusion electrode of a couple which consists of a cathode terminal and an anode electrode as solid polymer membrane is provided as an electrolyte layer and sandwiches said solid polymer membrane is

arranged, In a solid polyelectrolyte type fuel cell with which a separator of a gas impermeability couple was installed as sandwiched said gas diffusion electrode, ink which has carbon powder and water at least at the end of said gas diffusion electrode was applied, and it was impregnated.

[0030]In an invention of claim 11 which has the above-mentioned composition, hydrophilic processing of the end of a gas diffusion electrode can be carried out by ink which has carbon powder and water at least being impregnated. Furthermore, at the end of an electrode, since electrochemical reaction does not arise, compared with a reaction part, temperature becomes low. That is, by supplying humidification gas whose relative humidity is 100% to an electrode end part at temperature of a reaction part, in an electrode end part, condensation of water will arise and a wet seal will always be carried out. Therefore, it is not necessary to provide separately a seal part [bolting / a seal part / a sealant], and load is also equivalent. Therefore, local shearing stress of solid polymer membrane does not occur, but a fracture of solid polymer membrane can be prevented.

[0031]A solid polyelectrolyte type fuel cell corresponding to claim 12 is the solid polyelectrolyte type fuel cell according to claim 11, wherein a direction of a width dimension of said ink impregnated at said cathode terminal side is set up for a long time than a width dimension of said ink impregnated at said anode electrode side. By the above-mentioned composition, inhibition of supply to the cathode side of a proton generated by the anode side can be prevented like an invention of claims 3, 5, and 9 mentioned above, and corrosion of an electrode can be prevented. Therefore, width of a sheet arranged at a gas diffusion electrode is made to increase, and gas-seal performance can be improved.

[0032]

[Embodiment of the Invention]Hereafter, an example of an embodiment of the invention is concretely explained with reference to drawings. Identical codes are attached about the same member as the conventional technology shown by drawing 18 and drawing 19, and explanation is omitted.

[0033](1) A 1st embodiment [1st] of an embodiment [composition] is a thing corresponding to claims 1 and 7, It is applied to the solid polyelectrolyte type fuel cell with which the sealant 8 has been arranged as it was inserted into the solid polymer membrane 3 and the separator 5 and the peripheral part of the gas diffusion electrodes 1a and 1b was touched like the conventional example of drawing 19. The sectional view showing the cell structure which drawing 1 requires for a 1st embodiment, and drawing 2 are the exploded views showing cell structure.

[0034]As shown in drawing 1, from between the solid polymer membrane 3 and the sealants 8, covering the interface between the solid polymer membrane 3, and the catalyst bed 2a of the gas diffusion electrodes 1a and 1b and 2b, the sheet 9 is inserted, and it is made and

arranged. The sheet 9 consists of a 25-micrometer-thick tetrafluoroethylene perfluoroalkyl vinyl ether copolymer (PFA), and a hotpress is carried out for 15 minutes by the temperature of 120 **, and press pressure 20 kgf/cm².

[0035]As shown in drawing 2, the gas distribution groove 13 for supplying fuel gas, such as hydrogen, to the anode electrode 1a, and supplying oxidant gas, such as oxygen, to the cathode terminal 1b, respectively is formed in the separator 5. The object for fuel gas, the object for oxidant gas, and the manifolds 12a, 12b, and 12c for cooling water are formed in the seal part in each member, respectively.

[0036][Function and Effect] -- in a 1st embodiment that has the composition of the account of a top, the sheet 9 made to pinch in the seal part of the cell 4 can cover the solid polymer membrane 3, and the shearing stress applied near the seal part can be reduced. Therefore, it can prevent the solid polymer membrane 3 fracturing. and since it is a product made from PFA, its intensity is strong, and since it excels in endurance, the sheet 9 can assist the gas disassembler of the film 3, and the reliability of a gas-seal function boils it markedly, and improves. More specifically, it checked that the gas-seal function was maintained for at least 10,000 hours. According to such a 1st embodiment, since gas-seal performance improves, it becomes possible to attain improvement in reliability of a solid polyelectrolyte type fuel cell, and reinforcement. Even if it pinches the sheet 9 like drawing 3 as a modification of a 1st embodiment to the interface of the gas diffusion electrodes 1a and 1b, the catalyst bed 2a, and 2b, the same operation effect is obtained.

[0037](2) A 2nd embodiment [2nd] of an embodiment [composition] is a thing corresponding to claims 2 and 7, The upper surface or the undersurface of the separator 5 is touched, and it is applied to the solid polyelectrolyte type fuel cell with which the sealant 8 has been arranged as the peripheral part of the solid polymer membrane 3 and the gas diffusion electrodes 1a and 1b was touched. The direction of the solid polymer membrane 3 of an embodiment is not extended to a seal part, but the point of difference of such an embodiment and a 1st embodiment of the above is at the point that reduction of the operating area is carried out. According to a 2nd embodiment, as shown in the sectional view of drawing 4, it is characterized by having inserted the sheet 9, having made and having been arranged from between the sealant 8 of a couple, and eight comrades, over the solid polymer membrane 3, and the catalyst bed 2a of the gas diffusion electrodes 1a and 1b and 2b.

[0038][Function and Effect], since the sealant 8 is arranged in a 2nd embodiment by using account structure of a top so that the peripheral part of the solid polymer membrane 3 may be touched, Reduction of the area of the solid polymer membrane 3 to be used can be attained, it can contribute to cost reduction, and the same operation effect as a 1st embodiment of the above can be demonstrated in such a solid polyelectrolyte type fuel cell.

[0039](3) A 3rd embodiment [3rd] of an embodiment [composition] is a thing corresponding to

claims 3 and 7, In addition to the composition of said 1st embodiment, the direction of the width dimension of the sheet 9 arranged at the cathode terminal 1b side as shown in drawing 5 is characterized [constitutional] by being set up for a long time than the width dimension of the sheet 9 arranged at the anode electrode 1a side.

[0040][Function and Effect] -- in a 3rd embodiment that has account composition of a top. The proton generated by the anode electrode 1a side can be smoothly supplied to the cathode terminal 1b side by making longer than the width dimension of the sheet 9 arranged at the anode electrode 1a side the width dimension of the sheet b9 arranged at the cathode terminal 1b side. Therefore, $C+2H_2O \rightarrow CO_2+4H+$ While the corrosion of the electrode by the reaction $+4e^-$ can be prevented, the width of the sheet 9 is made to increase and gas-seal performance can be improved. Therefore, when the time of application-of-pressure operation and electrode differential pressure increase, it can respond immediately.

[0041](4) A 4th embodiment [4th] of an embodiment [composition] corresponds to claims 4 and 7, and is applied to the solid polyelectrolyte type fuel cell which the sealant 8 does not use. The sectional view showing the cell structure which drawing 6 requires for a 4th embodiment, and drawing 7 are the exploded views showing cell structure.

[0042]As shown in drawing 6, as it was inserted into the solid polymer membrane 3 and the separator 5 and the end of the gas diffusion electrodes 1a and 1b was covered, in a 4th embodiment, the sheet 91 of KO type has been arranged for the section. This sheet 91 comprises a 25-micrometer-thick TORAFURUORO ethylene-perfluoroalkyl vinyl ether copolymer (PFA). Fluorine grease is applied to the interface of the gas diffusion electrodes 1a and 1b and the sheet 91, and the seal of both interface is carried out.

[0043][Function and Effect] -- in a 4th embodiment made the composition of the account of a top, Some sheets 91 have covered the solid polymer membrane 3, since the sealant [bolting / the sealant] 8 moreover is not formed, the local shearing stress to the solid polymer membrane 3 can be reduced substantially, the fracture of the solid polymer membrane 3 can be prevented certainly, and improvement in gas-seal performance can be aimed at. Specifically, it is checked that the gas-seal function is maintained for 10,000 hours. According to such an embodiment, since gas-seal performance improves, it becomes possible to attain improvement in reliability of a solid polyelectrolyte type fuel cell, and reinforcement.

[0044](5) A 5th embodiment [5th] of an embodiment [composition] is a thing corresponding to claim 6, As shown in drawing 8, in addition to the composition of said 1st embodiment, the catalyst bed 2a and 2b are small provided the 1 surroundings rather than the gas diffusion electrodes 1a and 1b, and it is characterized by being constituted so that the sheet 9 may touch the peripheral part of this catalyst bed 2a and 2b.

[0045][Function and Effect] -- the thickness of the sheet 9 can be made to increase even to the catalyst bed 2a and the same grade as the thickness of 2b in a 5th embodiment that has such

composition Therefore, it becomes possible to improve the tolerance of the intensity in the sheet 9, or electrode differential pressure, and the reliability of a gas-seal function improves. As a result, the improvement in reliability of a solid polyelectrolyte type fuel cell and reinforcement are attained. On the other hand, the increase in the tolerance of electrode differential pressure leads to highly efficient-ization of a solid polyelectrolyte type fuel cell in order to make possible an increase and load change of a gas flow rate.

[0046]As a modification of a 5th embodiment, the sheet 9 in said 2nd embodiment The catalyst bed 2a, There are what touches the peripheral part of 2b (refer to drawing 9), that (refer to drawing 10) whose sheet 9 touches the peripheral part of the catalyst bed 2a and 2b in said 3rd embodiment, the thing (refer to drawing 11) which has the feature of claims 3 and 6 in a 2nd embodiment further, etc. In the fuel cell with which the solid polymer membrane 3 is not extended to the seal part with the embodiment of drawing 11, The direction of the width dimension of the sheet 9 which the sheet 9 touched the peripheral part of the catalyst bed 2a and 2b, and has been arranged at the cathode terminal 1b side is set up for a long time than the width dimension of the sheet 9 arranged at the anode electrode 1a side.

[0047](6) A 6th embodiment [6th] of an embodiment [composition] is a thing corresponding to claims 4, 5, and 6, In the portion which the sheet 91 arranged in said 4th embodiment at the cathode terminal 1b side touches the peripheral part of the catalyst bed 2a and 2b, and touches the solid polymer membrane 3 of the sheet 91 as shown in drawing 12, The direction of the width dimension of the portion arranged at the cathode terminal 1b side is characterized by being set up for a long time than the width dimension of the portion arranged at the anode electrode 1a side.

[0048][Function and Effect] -- in a 6th embodiment that has such composition, it can have a operation effect which the 3rd, 4, and 5 above-mentioned embodiment has. As a modification of a 6th embodiment, as shown in drawing 13, there are some etc. which were constituted so that the electrode 1a and the sheet 91 arranged at theb [1] side might touch the peripheral part of the catalyst bed 2a and 2b in both.

[0049](7) A 7th embodiment [7th] of an embodiment [composition] corresponds to claims 8 and 10, and drawing 14 is a sectional view showing the cell structure of a 7th embodiment. As shown in drawing 14, beforehand at the end of the porous carbon plate part of the gas diffusion electrodes 1a and 1b. The enamel (neo chlorofluorocarbon ND-2) of tetrafluoroethylene hexafluoropropylene is applied, heat treatment is performed at 360 **, and the coat material 10 from which thickness is set to 50 micrometers is coated. The 30-micrometer-thick catalyst bed 2a and 2b are applied to the gas diffusion electrodes 1a and 1b, a hotpress is carried out with the solid polymer membrane 3 on the same conditions as a 1st embodiment, and it is held with the separator 5.

[0050][Function and Effect] -- according to a 7th embodiment that has account composition of

a top, gas separating performance of coat material 10 improves the end of the solid polymer membrane 3 by that of a wrap. It is not necessary to provide separately the sealant [bolting / a sealant], and since it becomes equivalent [load], generating of the local shearing stress of the solid polymer membrane 3 is prevented, the fracture of solid polymer membrane is prevented certainly, and cross leakage can be prevented. It checked that the gas-seal function was specifically maintained for 10,000 hours. According to such this embodiment, since gas-seal performance improves, the improvement in reliability of a solid polyelectrolyte type fuel cell, reinforcement, and the improvement in reliability are attained.

[0051](8) An 8th embodiment [8th] of an embodiment [composition] is a thing corresponding to claims 9 and 10, As shown in drawing 15, the direction of the width dimension of the coat material 10 with which the cathode terminal 1b side was coated was set up for a long time than the width dimension of the coat material 10 with which the anode electrode 1a side was coated.

[0052][Function and Effect] -- in an 8th embodiment with the account composition of a top, supply by the side of the cathode of the proton generated by the anode side can be smoothly performed as well as a 3rd embodiment of the above. Therefore, in order for the case where the time of application-of-pressure operation and electrode differential pressure increase etc. to raise seal performance, even when the width dimension of the coating portion of the coat material 10 is made to increase, inhibition of supply to the cathode side of the proton generated with the anode is prevented, and the corrosion of an electrode can be prevented. According to this embodiment, when seal performance needs to be improved, corrosion can be prevented and the reliability of the cell of a solid polyelectrolyte type fuel cell increases.

[0053](9) A 9th embodiment [9th] of an embodiment [composition] corresponds to claim 11, and drawing 16 is a sectional view showing the cell structure of a 9th embodiment. As shown in drawing 16, the ink 11 which consists of carbon powder (Vulcan XC-72R), surface activity material, and pure water is applied to the end of the gas diffusion electrodes 1a and 1b which applied the catalyst bed 2a and 2b (67% of solid content), and a drying process is carried out to it at 120 **. Then, the solid polymer membrane 3 and a hotpress are performed on the same conditions as a 1st embodiment, and it is held with the separator 5.

[0054][Function and Effect] -- in a 9th embodiment that has the composition of the account of a top, hydrophilic processing of the end of the gas diffusion electrodes 1a and 1b can be carried out by the ink 11 which consists of carbon being impregnated. Furthermore, at the end of the electrodes 1a and 1b, since electrochemical reaction does not arise, compared with a reaction part, temperature becomes low. That is, by supplying the humidification gas whose relative humidity is 100% to the end of the electrodes 1a and 1b at the temperature of a reaction part, condensation of water will arise at the electrode 1a and the 1b end, and a wet seal will always be carried out. Therefore, it is not necessary to provide separately the seal part [bolting / a

seal part / a sealant], and load is also equivalent. Therefore, the local shearing stress in the solid polymer membrane 3 does not occur, but the fracture of the solid polymer membrane 3 can be prevented. Specifically, it checked that the gas-seal function was maintained for 10,000 hours. According to these above embodiments, gas-seal performance improves and the improvement in reliability of a solid polyelectrolyte type fuel cell and reinforcement are attained.

[0055](10) A 10th embodiment [10th] of an embodiment [composition] is a thing corresponding to claim 12, As shown in drawing 17, the width dimension of the ink 11 of the end by the side of the cathode terminal 1b was set up for a long time than the width dimension of the ink 11 of an impregnating [at the anode electrode 1a side] end.

[0056][Function and Effect] -- in a 10th embodiment of the account of a top, Since supply by the side of the cathode of the proton generated by the anode side can be smoothly performed as well as 3rd and 8th embodiments of the above, It can do, even when the width dimension of the ink 11 is made to increase, preventing inhibition of supply to the cathode side of the proton generated with the anode, and preventing the corrosion of an electrode. According to this embodiment, when seal performance needs to be improved, corrosion can be prevented and the reliability of the cell of a solid polyelectrolyte type fuel cell increases.

[0057](11) Although the tetrafluoroethylene perfluoroalkyl vinyl ether copolymer (PFA) was used as the sheets 9 and 91 in other embodiments which carried out embodiment ****, the sheet of fluoro-resins and Viton rubbers, such as polytetrafluoroethylene (PTFE) and a tetrafluoroethylene hexafluoropropylene copolymer (FEP), and the product made of silicone rubber otherwise -- business -- a potato is good. As the coat material 10, even if it uses polytetrafluoroethylene enamel and glass coat material, there is same effect. Instead of applying coat material, polytetrafluoroethylene (PTFE), The same effect can be acquired even if it carries out thermal melting arrival of the sheet of a tetrafluoroethylene hexafluoropropylene copolymer (FEP) or a tetrafluoroethylene perfluoroalkyl vinyl ether copolymer (PFA).

[0058]

[Effect of the Invention]The shearing stress by the sealant which is generated at the time of stack bolting [/ near the seal part of solid polymer membrane] according to this invention as explained above, By reducing the shearing stress resulting from the expansion accompanying change of the temperature of the solid polyelectrolyte membrane at the time of a load change, and water content, and contraction at the time of deactivation and storage, The cross leakage by the fracture of the film accompanying degradation of temporal solid polyelectrolyte membrane is prevented, and since it is possible to raise gas-seal performance, a solid polyelectrolyte type fuel cell with high reliability in which long-term operation is possible can be obtained.

[Translation done.]